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**Muscle Dysmorphia and Psychopathology: findings from an Italian sample of male
bodybuilders**

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Abstract

The aim of this study is to investigate the relationship between the risk of muscle dysmorphia and psychopathological symptoms in an Italian sample of male bodybuilders. Method: The sample was recruited online (145 men with a mean age of 30.0 years) and participants were asked to fill out the Muscle Dysmorphic Disorder Inventory (MDDI), Symptom Checklist-90-R (SCL-90-R), Dissociative Experiences Scale (DES-II), and to provide other socio-demographic data.

Bodybuilders at risk of muscle dysmorphia display greater global psychopathology and present higher scores on all SCL-90-R dimensions when compared to bodybuilders not at risk of muscle dysmorphia. Furthermore, risk of muscle dysmorphia is positively associated to dissociative symptoms. The Competitiveness dimension and anabolic steroid intake were not related to muscle dysmorphia, while age appeared to be more significant.

Findings are discussed based upon previous studies and directions for future research are suggested.

Keywords: Muscle Dysmorphia; Bodybuilding; Psychopathology; Dissociative Symptoms

1. Introduction

Bodybuilding has a relatively recent history and since the 1960's, has experienced increasing popularity in Western Countries (Parish et al., 2010). This increase in popularity might be due to the fact that body satisfaction has become a central aspect in self-concept, not only for women but also for men (McCabe and Ricciardelli, 2004), and because mass media presents exceptionally muscular men as a perfect standard of male beauty (Leit et al., 2001). Nowadays, society often considers manliness and muscularity as synonymous (Thompson and Cafri, 2007). There are several reasons why people decide to do bodybuilding (Parish et al., 2010) and these cannot always be reduced to problems relating to low self-esteem or threatened virility, but may also inclusive of physical health reasons. The sport of bodybuilding has proven to be intriguing to researchers in the field of mental health, and some have examined diverse psychological dimensions in this athletic population such as body image dissatisfaction and the pursuit of the perfect ideal body (Peters and Phelps, 2001; Goldfield and Woodside, 2009), social physique anxiety (Schwerin et al., 1996), unhealthy diet and disordered eating behaviors (Davis and Scott-Roberston, 2000; Goldfield et al., 2006), bodybuilding dependence or excessive exercise (Smith and Hale, 2004; Hale et al., 2010; Emini and Bond, 2014), anabolic steroid abuse (Davis and Scott-Roberston, 2000) and related psychological disorders (Goldfield and Woodside, 2009; Moss et al., 2010), narcissism (Rubinstein, 2003), social functioning (Ahmadi et al., 2013), and sexual functioning. Specifically, in 1993, Pope, Katz and Hudson observed a particular syndrome in a sample of body builders called Reverse Anorexia, subsequently renamed muscle dysmorphia. Muscle dysmorphia is currently recognized by DSM-5 (APA, 2013) as a subtype of Body Dysmorphic Disorder. It is a syndrome characterized by an obsessive preoccupation

regarding one's body size, perceived as small, weak, puny and not large and lean enough (Pope et al., 2000). However, individuals who experience muscle dysmorphia usually present hypertrophic muscles, with a desire to further increase their muscles mass. Hence the comparison with Anorexia Nervosa (Pope et al., 1993). The preoccupation with muscularity pushes these individuals to adopt dangerous health behaviors such as excessive training, restrictive diet and anabolic steroid consumption, all of which may compromise social and working functioning (Pope et al., 2000). The estimated age of onset of muscle dysmorphia is typically between late adolescence and early adulthood, and the etiology of this condition requires more detailed studies (Fabris et al., 2017). A large percentage of individuals with muscle dysmorphia present poor or absent insight (Cafri et al., 2008), they spend a great deal of time thinking about their own muscularity (Cafri et al., 2008), they manifest avoidant behaviors that are revealing from a clinical point of view as well as checking behaviors, in particular related to appearance and muscularity (Olivardia et al., 2000). Moreover, people with muscle dysmorphia symptoms report greater body dissatisfaction and aspire to further increase their weight (Danilova et al., 2013). The vast majority of people with muscle dysmorphia are on a high protein diet (Segura-Garcia et al., 2010), and they frequently resort to dietary supplements (Hitzeroth et al., 2001; Danilova et al., 2013). These individuals feel obliged to follow their diet plan and training program, they demonstrate scarce mastery of their own physical activity (Cafri et al., 2008), and when they skip a training session, they feel more distressed than individuals at low risk of muscle dysmorphia.

Muscle dysmorphia is positively associated to global psychopathology (Wolke and Sapouna, 2008) and to a variety of symptoms and psychiatric disorders. Data from studies involving clinical samples reveal an association between muscle dysmorphia diagnosis, Anxiety

Disorders, Bipolar Disorders, Depression or lifetime history of depression (Olivardia et al., 2000; Cafri et al., 2008), and Mania and Hypomania (Pope et al., 1993).

Data from studies involving non-clinical samples show an association between measures of risk of muscle dysmorphia and psychopathological symptoms related to Obsessive Compulsive Disorder, Anxiety Disorders, Hostility (Maida and Armstrong, 2005), Depression, Alexithymia (Grieve and Shacklette, 2012), Social Physique Anxiety (Thomas et al., 2014), Interpersonal Sensitivity and Paranoia (McFarland and Kaminski, 2009), and Exercise Dependence (Soler et al., 2013).

Furthermore, the relations between muscle dysmorphia and eating disorders have received special attention. Based upon this evidence, some authors argue that muscle dysmorphia can be classified as an eating disorder (dos Santos Filho et al., 2015). Pope et al. (2005) found that 22% of men with Body Dysmorphic Disorder (BDD) have muscle dysmorphia and, when compared to BDD only, these men are at an increased risk of negative long-term outcomes considering that BDD- muscle dysmorphia co-morbidity is associated with a lower quality of life, higher suicide risk, and more anabolic steroid and other substance intake. Co-morbidity between muscle dysmorphia and BDD has also been confirmed by other studies (Hizeroth et al., 2001). Finally, people with muscle dysmorphia symptoms also tend to present low self-esteem (Wolke and Sapouna, 2008; Murray et al., 2013; Compte et al., 2015), difficulties in emotional regulation (Murray et al., 2013), perfectionism (Maida and Armstrong, 2005), anxiety in social interaction (Compte et al., 2015) and insecure attachment style, in particular avoidant attachment (Fabris et al., 2017).

Nevertheless, previous studies' results present some disagreements, for instance Maida and Armstrong (2005) found no association between muscle dysmorphic symptoms and

Paranoia, while Boyda and Shevlin (2011) did not observe a significant relationship between muscle dysmorphia symptomatology and Depression. Furthermore, the relationship between muscle dysmorphia and anabolic steroid intake is debatable (Fabris et al., 2017).

Literature has highlighted the presence of dissociative symptoms in other disturbances characterized by body image dissatisfaction, such as eating disorders. Many studies have recognized the importance of dissociation for the understanding of these disorders: different hypotheses have been proposed to explain the link between dissociation and body image disorders, however they share the recognition of the importance of dissociative experiences on the onset of the disturbances (Dalle Grave et al., 1996; Fuller-Tyszkiewicz and Mussap, 2008). Some studies demonstrate that individuals with muscle dysmorphia often report adverse experiences in their life course, possibly related to trauma and to consequent development of dissociative symptoms (Wolke and Sapouna, 2008; Fabris et al., 2017). However, to our knowledge, no studies took into account the co-occurrence of dissociative symptoms and MD. Given that muscle dysmorphia presents body image dissatisfaction, we think that investigating the link between muscle dysmorphia and dissociation could be useful to reach a better understanding of the muscle dysmorphia onset and development.

The aim of this study is to investigate psychopathological features associated with muscle dysmorphia symptoms in the Italian context using a sample of competitive and non-competitive bodybuilders. In particular, we focus on the possible link of muscle dysmorphia and dissociative experiences. We expect to replicate some of the findings of previous research on psychopathological correlates of muscle dysmorphia (Cafri et al., 2008; Wolke and Sapouna, 2008). In addition, on the basis of literature on body image disorders, we aim to find a significant positive association between muscle dysmorphia and dissociative symptoms.

2. Methods

2.1. Participants

Participants were invited to participate through bodybuilding-related Facebook groups. Participants were included in our sample if they were Italian, between 18 and 65 years of age, and were currently involved in bodybuilding training (both competitive and non-competitive). Competitive Bodybuilders are defined as men involved in national or international bodybuilding competitions, while non-competitive bodybuilders are men that train without the motivation to compete. All participants were voluntary and did not receive incentives for participation. Data was collected during February through November of 2015 using an online questionnaire. After expressing their informed consent to participate in the survey, a total of 217 participants were recruited. Of these participants, 72 were excluded because they did not meet the selection criteria since they did not complete the questionnaire in its entirety.

The final sample consisted of 145 men and had a mean age of 30.0 years ($SD = 9.1$; range 18-62). As regards education level, 23% ($n = 34$) of the participants had completed middle school, 59% ($n = 86$) had obtained a high school diploma, and 17% ($n = 27$) had completed college. In regard to relationship status, 59% of the participants are in a stable relationship, and 17% ($n=25$) were married.

As to years of bodybuilding, 79% ($n = 115$) of the participants had been doing body building activity for more than 3 years, and 21% ($n = 30$) for less than 3 years. On the whole, 44% ($n = 64$) of the participants reported taking part in body-building competitions, while the others were non-competitive. In regard doping substances, 15% ($n = 21$) of the sample reported the use of anabolic steroids.

2.2. Instruments

2.2.1 Socio Demographic Questionnaire. Participants completed a questionnaire inquiring about their age, education, number of years doing bodybuilding, competitiveness and anabolic steroid consumption.

2.2.2. Muscle Dysmorphic Disorder Inventory (MDDI, Santarneckchi and Dèttore, 2012). The MDDI is a 13-item self-report tool intended to measure the risk of muscle dysmorphia, it contains questions on cognitions, emotions, and behaviors related to body image. Item response categories are on a 5-point Likert scale, ranging from “never” to “always”; the score of the test is obtained as the sum of the scores of each item. For this study, a threshold value (> 39 points) was used, which was proposed by Varangis et al. (2012) showing 75.0% specificity and 73.7% sensitivity, with a Cronbach’s alpha coefficient equal to 0.85 in an Italian validation study (Santarneckchi and Dèttore, 2012). Cronbach’s alpha in this study was 0.82.

2.2.3. Symptom Checklist 90- Revised (SCL-90-R; (Prunas et al., 2012). The Italian version of SCL-90-R is a 90-item self-report tool designed to assess psychological symptoms in an adult population. SCL-90-R includes 9 dimensions (somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid-ideation, and psychoticism) and 3 global indexes (Global Severity Index, Positive Symptom Distress Index, and Positive Symptom Total). Higher scores on SCL-90-R indicate greater psychological distress. SCL-90-R presents 7 supplementary items to assess some disordered eating behavior symptoms, sleep disorder symptoms and suicidal ideation. In this study a Cronbach’s alpha coefficient was 0.78.

2.2.4. Dissociative Experience Scale – II (DES-II; Carlson and Putnam, 2000). This is a 28-item self-report tool to evaluate the presence of dissociative symptoms in an adult population. The average of all the answers provides the total score. If the subjects obtain a total score of 30

or above it is recognized as a positive screening for dissociative disorders, and in this case it is preferred to conduct a thorough investigation of dissociative disorder through a clinical interview. The Italian version of DES-II showed good psychometric properties for use in inmate and community samples (Garofalo et al., 2015) and for this study a Cronbach's alpha coefficient is 0.81.

2.3. Study design and Data analysis

Participants were invited through bodybuilding-related Facebook groups. We asked for the participation of individuals doing bodybuilding. Participants were included in our sample if they were Italian, between 18 and 65 years of age, and were currently involved in bodybuilding training (both competitive and non-competitive). Competitive bodybuilders are men involved in national or international bodybuilding competitions, while non-competitive bodybuilders are men that train without the motivation to compete. All subjects were voluntary and did not receive incentives. Data was collected during February through November of 2015 using an online questionnaire.

2.4 Data analysis strategy

Data analysis was performed using the SPSS (version 22). As the first step in the analyses, we reported frequency and descriptive statistics of MDDI scores and investigated the association between MDDI scores and sociodemographic variables, namely age, competitiveness and use of anabolic steroids. Associations were tested using independent samples t-test for age and χ^2 test for competitiveness and use of anabolic steroids.

In order to study the relationship between risk of muscle dysmorphia and psychopathological traits, we reported descriptive statistics for symptomatological dimensions measured by the SCL-90-R and DES-II for both of the subsamples (at risk and not-at risk for

muscle dysmorphia). We tested for significant differences between the two groups, using Bonferroni-corrected independent-samples t-tests, reporting the effect size for each comparison (eta-squared). Lastly, we computed and reported the frequencies of SCL-90-R dimension scores recoded according to the cutoffs set by the creators of the instrument (Prunas et al., 2012), distinguishing between low, mean, moderate and high levels of symptoms.

3. Results

As the first step in the analyses, we computed descriptive statistics for MDDI scales. The mean value for the general score was 29.4 (SD = 6.3). Applying the cutoff of 39, we categorized the participants in two groups: 1. At risk for muscle dysmorphia (25%, $n = 36$), and 2. Not-at risk for muscle dysmorphia (75%, $n = 109$).

In order to investigate the relationships of muscle dysmorphia with age, we performed a t-test on age using risk of muscle dysmorphia as the independent variable. The difference was significant, $t(143) = 2.70$, $p = .008$, $\eta^2 = .05$. Individuals at risk for muscle dysmorphia were younger ($M = 26.5$; $SD = 6.0$) than not at risk participants ($M = 31.0$; $SD = 9.5$). To test for the association between muscle dysmorphia risk and competitiveness and use of steroids we conducted two χ^2 tests. Both yielded non-significant results (see table 1), indicating the lack of influence of the two variables on risk of muscle dysmorphia.

Next, we performed independent samples t-test to find any significant differences between the two groups regarding the psychopathology scores, i.e. the SCL-90 dimensions and the DES-II score. Table 2 shows the results of these analyses. It can be seen that all the psychopathological scales considered show significantly higher levels among individuals at risk of muscle dysmorphia. The size of this effect is moderate, with the SCL-90 Global score Index (GSI) having an effect size equal to .21.

Lastly we looked at the distribution of pathological levels of symptoms among the participants at risk and not-at risk. Table 3 presents the percentages of individuals with different levels of symptomatology for each of the dimensions evaluated by the SCL-90. Chi-square tests were conducted to test for the association between muscle dysmorphia state and levels of symptoms. All the tests were significant, with effect sizes (computed as Cramer's V) ranging from .29 to .54. For all the dimensions considered, categories were distributed very differently. With respect to all the dimensions investigated by SCL-90, a minority of individuals at risk for muscle dysmorphia reported low levels of symptoms (range: 13% - 21%). Instead, among individuals not at risk for muscle dysmorphia these percentages are relevantly higher, ranging from 31% to 55%. Conversely, the percentage of individuals at risk for muscle dysmorphia with high levels of symptoms on the SCL-90 scales is much higher (range: 29% - 47%) than what we found for individuals not-at risk (range: 3% - 14%). Looking at the SCL-GSI, it emerged that only 5% of individuals not at risk for muscle dysmorphia reported high level of symptom severity, while this percentage is equal to 47% among individuals at risk for muscle dysmorphia. The more prevalent symptoms in individuals at risk for muscle dysmorphia regard Interpersonal sensitivity, anxiety, and psychoticism.

As regards DES-II scores, we found a significant association between risk of muscle dysmorphia and dissociative symptoms ($t(143) = -4.5, p < .001$), with individuals at risk for muscle dysmorphia having a mean score equal to 24.2 ($SD = 15.2$). In particular, 14 out of 36 individuals at risk for muscle dysmorphia reported DES-II scores equal or higher to 30, which is the cutoff value used to identify individuals with severe dissociative symptoms (Carlson and Putnam, 2000).

4. Discussion

In our sample, a quarter of the bodybuilders presented a high risk of receiving an muscle dysmorphia diagnosis. These data are in line with those obtained from a similar sample in one of our previous studies (Fabris et al., 2017). The risk of muscle dysmorphia in our population of bodybuilders is higher than that of the Italian sample made up of first year college students earning a degree in Sport Science (Bo et al., 2014). Our results are also similar to those reported by Nieuwoudt et al. (2015) from a sample of Australian of weightlifters similarly recruited online through Facebook, and to those of Maida and Armstrong (2005) in an American sample of non-competitive weightlifters.

In our sample, the use of anabolic steroids and competitive activity are not correlated to risk of muscle dysmorphia, but the association with age was found to be significant. The data, in fact, show that athletes in the younger age group are more at risk of a positive diagnosis of muscle dysmorphia. However we do not have sufficient data to explain this association and thus further in depth studies are needed to clarify the link. We know that the socio-cultural model of male aesthetic perfection has changed in the direction of increasingly hypertrophic muscularity (Leit et al., 2001), and that the issue of body image satisfaction has become more and more important in the male population (McCabe and Ricciardelli, 2004). This fact may also be reflective of cultural dimensions, however other hypotheses can be put forward. For example, young adults may be more sensitive to body dissatisfaction and muscular-related concerns than older men.

As far as the psychopathological aspects are concerned, bodybuilders at risk of muscle dysmorphia present significantly higher scores on all 9 dimensions of the SCL-90-R compared to bodybuilders not at risk of muscle dysmorphia, with higher scores than those of the normative Italian sample (Prunas et al., 2012). Moreover, participants at risk of muscle dysmorphia tend to

be largely concentrated in the higher levels of the dimensions mentioned above. Our data confirms a significant relation between high levels of muscle dysmorphia and global psychopathology (Wolke and Sapouna, 2008), and moderate to high distress about one's symptoms. People at risk of muscle dysmorphia have much higher scores on Interpersonal Sensitivity than normative individuals, thus indicating an attitude of distrust in relations with others, problems in interpersonal relations, and lack of self-esteem. This association is in line with the findings of McFarland and Kaminski (2009), which established Interpersonal Sensitivity as a strong predictor of muscle dysmorphia, and with other studies that find associations between muscle dysmorphia measures and difficulty in social relations (Compte et al., 2015), interpersonal distrust (Segura-Garcia et al., 2010), low self-esteem (McFarland and Kaminski, 2009), and avoidant attachment style (Fabris et al., 2017).

We also found a connection between muscle dysmorphia risk and obsessive-compulsive symptomatology and psychoticism. While the link between muscle dysmorphia and OCD is widely confirmed in the literature, psychoticism has received little attention and to date is not reported to be associated with muscle dysmorphia traits (McFarland and Kaminski, 2009). However, it must be remembered that body image disorders can take forms of delirium (Phillips et al., 2014) and a considerable percentage of individuals with muscle dysmorphia present insight deficit (Cafri et al., 2008). In extensive studies, depression and anxiety symptoms have been associated with risk of muscle dysmorphia, and in our sample, those at risk for muscle dysmorphia replicate these results.

In line with the literature (McFarland and Kaminski, 2009), hostility is higher in our sample of bodybuilders at risk of muscle dysmorphia. According to Maida and Armstrong (2005) hostility contributes to the development of muscle dysmorphia and the authors hypothesize that

if it is addressed to themselves, it could prompt the emergence of an eating disorder in the male.

In line with McFarland and Kaminski (2009), men with a high risk of a positive muscle dysmorphia diagnosis present more symptoms of Paranoid ideation. However, these results are not supported by the research of Maida and Armstrong (2005) and require further study.

Finally, in our research, although Somatization is higher in participants at risk of muscle dysmorphia, the link is weaker compared to the other psychopathological dimensions. To date, symptoms of somatization disorders have not been found in men at risk of muscle dysmorphia (Maida and Armstrong, 2005), and the poor correlation between body image disorders and somatoform disorders (Phillips et al., 2004) explains why BDD has been removed from the category of somatoform disorders.

To the best of our knowledge, this is the first research to study and find a positive association between muscle dysmorphia risk and dissociative symptoms. This finding suggests a link between muscle dysmorphia and traumatic developmental experiences, about which little is known at present (Fabris et al., 2017). Specific studies are needed to verify whether the association between the perception and the experience of one's body, traumatic experiences, and dissociative symptoms can be a model applicable to the development of muscle dysmorphia.

5. Conclusions

This study highlighted the presence of a large percentage (25%) of bodybuilders at risk for muscle dysmorphia. Specifically, our results confirm the existence of a significant association between risk of muscle dysmorphia and other psychopathological symptoms: The majority of bodybuilders at risk of muscle dysmorphia reported higher levels of every psychopathological dimension, with particular reference to Interpersonal Sensitivity, Obsessive-Compulsive Disorder, Psychoticism, followed by symptoms of depression and anxiety (Anxiety and Phobic

Anxiety). Together these results confirm what is reported by previous studies (Maida and Armstrong, 2005; Wolke and Sapouna, 2008; McFarland and Kaminski, 2009; Grieve and Shacklette, 2012), extending the validity of these findings to the Italian context, closing a gap in the literature.

The novelty of this study is the inclusion of dissociation as a possible correlate of muscle dysmorphia symptoms. For the first time, we demonstrate that individuals at risk for muscle dysmorphia report higher frequency of dissociative experiences. This result is important for scholars investigating the onset of the disorder. Even though the relationship between dissociation and other pathologies characterized by body image dissatisfaction (e.g. eating disorders) has been repeatedly confirmed, there is no consensus about the interpretation of this finding. Some authors hypothesized that traumatic experiences may explain the link between the development of a negative body image and symptoms of dissociation (Dalle Grave et al., 1996). However the relationship between traumatic history and body image-related disorders does not appear neither strong nor consistent. (Ball et al., 1999). Fuller-Tyszkiewicz and Mussap (2008) proposed the body image instability hypothesis as a possible alternative explanation of the link between body image disorder and dissociation. According to their hypothesis, this link would relate to an underlying instability of body image caused by body-based dissociative experiences. Our study is an exploratory one, and we are not yet able to provide answers supporting one of the possible explanations. However, this study paves the way for further investigations aimed at deepening our understanding of the phenomenon.

Lastly, the participants' age could have a greater influence on the muscle dysmorphia risk than other variables such as use of anabolic steroids and competitiveness, which have not been found to be significantly related to risk of muscle dysmorphia in the current study. This leads to

the idea that age appears to be a prominent area for further investigations in muscle dysmorphia research.

Taken globally, our findings confirm muscle dysmorphia risk as a condition associated with marked psychopathology and with a range of symptoms, and can affect bodybuilders in a percentage not to be overlooked, causing considerable distress. This work has attempted to make a contribution to the knowledge of muscle dysmorphia risk in bodybuilding and its relation to the main psychopathological dimensions in the Italian context, closing a gap in the literature. While not providing definitive results on the disagreements over the correlation of muscle dysmorphia symptoms and some psychopathological dimensions, our study may be useful to researchers all over the world interested in spreading knowledge about muscle dysmorphia risk and related psychopathological features in various cultures, and in bodybuilding in particular. Psychologists and health professionals working in the sport context may be able to implement prevention and intervention strategies for athletes presenting muscle dysmorphia -related symptoms, improving the efficacy of interventions and promoting the health of individuals in sport.

From a clinical point of view, it is important to recognize the presence of moderate-to-high levels of dissociative experience in individuals at risk for muscle dysmorphia. In fact, as found for eating disorders, dissociation could be a potential moderator of treatment efficacy (La Mela et al., 2013): hence, it should be considered in planning new treatments.

Limits and Future Directions

Our study has some limits. First of all, muscle dysmorphia symptoms were assessed by a self-report tool (MDDI) which cannot replace a diagnosis but simply points out the participant's risk of receiving a positive diagnosis. As regards the absence of a significant link between risk of muscle dysmorphia and use of anabolic substances, it must be remembered that we relied on the

participant's self-declaration and we therefore did not use direct or indirect measurements, which might have been a more reliable indicator of the truth about doping activity. Factors like social desirability and concern about anti-doping legal measures are likely to have had an effect despite the anonymity of the survey.

Although our results are in line with the current literature, we found certain discrepancies that could be the basis for further research. For instance, we found relations between the risk of muscle dysmorphia and symptomatology of somatization and psychoticism which have not been found previously, and also the association between risk of muscle dysmorphia and paranoia; an association still debatable in our field of research. The data show interesting associations between risk of muscle dysmorphia, age, and measurements of dissociation, which deserve further studies in future.

Another important finding that deserves further investigation is the relationship between dissociative experiences and muscle dysmorphia: the study of this link and its possible relationship with traumatic experiences could be useful to identify risk factors and clarify the onset process of the disorder.

Conflict of Interests Statement

The authors declare that they have no competing interests.

Compliance with ethical standards

Ethical approval: all procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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Table 1

Relationships between risk of MD and competitiveness and use of steroids.

| | Risk MD (MDDI > 39) | | | | Chi-square | df | p | Effect-size (phi) |
|-----------------------------|---------------------|-----|-----|-----|------------|----|-----|-------------------|
| | No | | Yes | | | | | |
| | | | | | | | | |
| Competitive/non competitive | 77% | 74% | 23% | 26% | .12 | 1 | .73 | .03 |
| Use of Steroids (yes/no) | 75% | 76% | 25% | 24% | .011 | 1 | .91 | .01 |

Note. MD (Muscular Dysmorphia); No (bodybuilders not at risk of MD); Yes (bodybuilders at risk of MD)

Table 2

Means, standard deviations, t-test for difference between participants at-risk and non-at-risk of MD.

| | Risk of MD | | | | t | Df | p | Effect size (eta-squared) |
|-----------------------|------------|-------|-------|-------|-------|-----|-------|---------------------------|
| | No | | Yes | | | | | |
| | M | SD | M | SD | | | | |
| SCL-90 Somatiz. | 50.27 | 9.59 | 58.07 | 10.96 | -4.08 | 143 | <.001 | 0.10 |
| SCL-90 OC | 45.64 | 8.49 | 57.46 | 11.74 | -6.55 | 143 | <.001 | 0.23 |
| SCL-90 Interp. Sens. | 47.84 | 7.25 | 59.06 | 12.77 | -6.53 | 143 | <.001 | 0.23 |
| SCL-90 Depress | 47.83 | 8.25 | 57.74 | 12.40 | -5.46 | 143 | <.001 | 0.17 |
| SCL-90 Anxiety | 48.71 | 7.97 | 58.32 | 12.32 | -5.42 | 143 | <.001 | 0.17 |
| SCL-90 Hostility | 49.04 | 10.41 | 58.15 | 12.54 | -4.32 | 143 | <.001 | 0.12 |
| SCL-90 Phobic Anxiety | 47.52 | 7.70 | 57.26 | 11.78 | -5.71 | 143 | <.001 | 0.19 |
| SCL-90 Paranoid Id. | 48.28 | 9.65 | 57.28 | 14.39 | -4.26 | 143 | <.001 | 0.11 |
| SCL-90 Psychoticism | 47.73 | 9.11 | 59.94 | 11.98 | -6.42 | 143 | <.001 | 0.22 |
| SCL-90 GSI | 48.11 | 8.78 | 60.04 | 12.96 | -6.23 | 143 | <.001 | 0.21 |
| SCL-90 PST | 48.48 | 11.10 | 60.90 | 12.74 | -5.61 | 143 | <.001 | 0.18 |
| SCL-90 PSDI | 48.97 | 9.72 | 55.50 | 10.96 | -3.38 | 143 | .001 | 0.07 |
| DES-II | 14.24 | 10.01 | 24.23 | 15.15 | -4.52 | 143 | <.001 | 0.13 |

Table 3

Distribution of psychopathological dimensions in the at risk and non-at risk for MD groups.

| | Risk of MD | | | | | | | | Chi-square | df | p | Effect-size (Cramer's V) |
|----------------------------------|------------|--------|----------|-------|-------|--------|----------|-------|------------|----|-------|-----------------------------|
| | No | | | | Yes | | | | | | | |
| | Low | Medium | Moderate | High | Low | Medium | Moderate | High | | | | |
| SCL-90 Somatization. | 30.9% | 40.0% | 19.1% | 10.0% | 13.2% | 31.6% | 23.7% | 31.6% | 13.77 | 3 | .003 | .31 |
| SCL-90 OC | 51.8% | 30.9% | 13.6% | 3.6% | 15.8% | 26.3% | 26.3% | 31.6% | 32.36 | 3 | <.001 | .47 |
| SCL-90 Interpersonal Sensitivity | 39.1% | 46.4% | 10.9% | 3.6% | 18.4% | 23.7% | 10.5% | 47.4% | 42.37 | 3 | <.001 | .54 |
| SCL-90 Depression | 43.6% | 31.8% | 20.9% | 3.6% | 21.1% | 23.7% | 26.3% | 28.9% | 21.49 | 3 | <.001 | .39 |
| SCL-90 Anxiety | 36.4% | 42.7% | 15.5% | 5.5% | 18.4% | 31.6% | 7.9% | 42.1% | 32.07 | 3 | <.001 | .47 |
| SCL-90 Hostility | 44.5% | 32.7% | 9.1% | 13.6% | 18.4% | 28.9% | 15.8% | 36.8% | 14.04 | 3 | .003 | .31 |
| SCL-90 Fobic Anxiety | 30.9% | 58.2% | 8.2% | 2.7% | 18.4% | 34.2% | 13.2% | 34.2% | 32.01 | 3 | <.001 | .47 |
| SCL-90 Paranoid Id. | 46.4% | 24.5% | 20.0% | 9.1% | 15.8% | 21.1% | 34.2% | 28.9% | 17.72 | 3 | .001 | .35 |
| SCL-90 Psychoticism | 54.5% | 25.5% | 12.7% | 7.3% | 18.4% | 21.1% | 18.4% | 42.1% | 29.75 | 3 | <.001 | .45 |
| SCL-90 GSI | 40.9% | 33.6% | 20.9% | 4.5% | 15.8% | 23.7% | 13.2% | 47.4% | 39.57 | 3 | <.001 | .52 |
| SCL-90 PST | 37.3% | 33.6% | 18.2% | 10.9% | 15.8% | 21.1% | 15.8% | 47.4% | 26.09 | 3 | <.001 | .42 |
| SCL-90 PSDI | 39.1% | 35.5% | 18.2% | 7.3% | 21.1% | 23.7% | 31.6% | 23.7% | 11.88 | 3 | .008 | .29 |